Amendments to the Claims:

This listing of claims will replace all prior versions, and listings, of claims in the application:

Listing of claims:

Claim 1 (currently amended). A method for monitoring fabrication processes of structured surfaces in a semiconductor production, the method which comprises:

~~providing~~ generating reference signatures of structured surfaces by measuring ~~at least one distribution selected from the group consisting of a local distribution and~~ an intensity distribution of images varying at least a wavelength and a polarization of an electromagnetic radiation, the polarization of the electromagnetic radiation being varied by a rotation apparatus rotating an electromagnetic radiation source, the images being selected from the group consisting of diffraction images and scattered light images of a plurality of individual structures of surfaces of production prototypes having a specified quality;

providing at least one of a neural network and a fuzzy logic having a learning capability by adjusting a weighting of the at least one of the neural network and the fuzzy logic as a function of the reference signatures;

measuring at least one signature of a test specimen surface to be monitored by simultaneously registering a plurality of individual structures of the test specimen surface to be monitored by using ~~at least one distribution selected from the group consisting of a local distribution and~~ an intensity distribution of images varying at least a wavelength and a polarization of an electromagnetic radiation, the polarization of the electromagnetic radiation being varied by a rotation apparatus rotating an electromagnetic radiation source, the images being selected from the group consisting of diffraction images and scattered light images for providing a measured signature;

performing measurements for both the reference signatures and the at least one signature of the test specimen surface to be monitored one at a time;

comparing the measured signature with the reference signatures for providing comparison results by using at least one of the fuzzy logic and the neural network to evaluate similarity between the reference signatures and the measured signature; and

if a similarity between the reference signatures and measured signature has been found in the comparison step, then performing the step of:

classifying parameters of the test specimen surface based on the comparison results;

or otherwise performing the steps of:

measuring individual structures of the test specimen surface with a high resolution measuring device for providing absolute quantities of the individual structures on the surface with high resolution ~~for specifying a quality of the test specimen surface~~ and for providing a further reference signature; and

adjusting the weighting of at least one of the fuzzy logic and the neural network as a function of the further reference signature;

classifying parameters of the test specimen surface based on the measurement of the individual structures.

Claim 2 (original). The method according to claim 1, which comprises providing the plurality of individual structures

such that the plurality of individual structures form a nonperiodic pattern.

Claim 3 (original). The method according to claim 1, which comprises providing the plurality of individual structures such that the plurality of individual structures form a lattice having different periodicities along different directions.

Claim 4 (original). The method according to claim 1, which comprises generating the reference signatures optically by measuring at least one of a diffraction and a scattering of an electromagnetic radiation at the structured surfaces.

Claim 5 (original). The method according to claim 1, which comprises generating the at least one signature optically by measuring at least one of a diffraction and a scattering of an electromagnetic radiation at the plurality of individual structures of the test specimen surface to be monitored.

Claims 6-9 (cancelled).

Claim 10 (original). The method according to claim 1, which comprises classifying the test specimen surface by selectively

classifying the test specimen surface as a good test specimen surface and a bad test specimen surface.

Claim 11 (original). The method according to claim 1, which comprises providing a classification in accordance with graduated quality classes for classifying the test specimen surface.

Claim 12 (original). The method according to claim 1, which comprise providing a classification in accordance with specific production faults for classifying the test specimen surface.

Claim 13 (original). The method according to claim 1, which comprises monitoring a production of periodic memory element structures.

Claim 14 (original). The method according to claim 1, which comprises monitoring a production of nonperiodic logic structures.

Claim 15 (original). The method according to claim 1, wherein the step of providing the reference signatures includes producing a classification system by assigning given production prototypes having a specified quality to

measurement data of the reference signatures of the given production prototypes.

Claim 16 (original). The method according to claim 1, wherein the step of providing the reference signatures includes producing a classification system by assigning at least one of the production prototypes having the specified quality and measurement data of the reference signatures of the production prototypes to at least two classes.

Claim 17 (original). The method according to claim 1, wherein the step of providing the reference signatures includes providing reference signatures for different products, and the step of classifying the parameters of the test specimen surface includes identifying a product.

Claim 18 (original). The method according to claim 1, wherein the step of providing the reference signatures includes adjusting at least one of the production prototypes in different ways, and the step of classifying the parameters of the test specimen surface includes classifying a misadjustment of a test specimen.

Claim 19 (original). The method according to claim 1, which comprises providing the structured surfaces as microstructured surfaces.

Claim 20 (currently amended). A device for monitoring fabrication processes of structured surfaces in a semiconductor production, comprising:

a reference signature apparatus for providing reference signatures of structured surfaces, said reference signature apparatus being configured for performing a measurement of reference signatures by measuring ~~at least one distribution selected from the group consisting of a local distribution and~~ an intensity distribution of images varying at least a wavelength and a polarization of an electromagnetic radiation, the images being selected from the group consisting of diffraction images and scattered light images of a plurality of individual structures of a surface of production prototypes having a specified quality;

an apparatus for providing at least one of a neural network and a fuzzy logic having a learning capability by adjusting a weighting of the at least one of the neural network and the fuzzy logic as a function of the reference signatures;

a measuring apparatus operatively connected to said reference signature apparatus, said measuring apparatus measuring at least one signature associated with a test specimen surface to be monitored by simultaneously registering a plurality of individual structures of the test specimen surface to be monitored by using ~~at least one distribution selected from the group consisting of a local distribution and~~ an intensity distribution of images varying at least a wavelength and a polarization of an electromagnetic radiation, the images being selected from the group consisting of diffraction images and scattered light images for providing a measured signature, measurements for both the reference signatures and the at least one signature of the test specimen surface to be monitored being performed one at a time;

a rotation apparatus for varying the polarization of the electromagnetic radiation by rotating an electromagnetic radiation source;

a comparison module operatively connected to said measuring apparatus, said comparison module comparing the measured signature with the reference signatures and providing comparison results by using at least one of the fuzzy logic and the neural network to evaluate similarity between the reference signatures and the measured signature;

a classification module operatively connected to said comparison module; and

a high-resolution measuring device for measuring individual structures of the test specimen surface for providing absolute quantities of the individual structures on the surface with high resolution ~~specifying a quality of the test specimen surface~~ and for providing a further reference signature, the weighting of the at least one of the neural-network and the fuzzy logic being adjusted as a function of the further reference signature;

said classification module classifying parameters of the test specimen surface based on the comparison results, if a similarity between the reference signatures and measured signature has been found in the comparison step, otherwise classifying parameters of the test specimen surface based on the measurement of the individual structures.

Claim 21 (original). The device according to claim 20, wherein said reference signature apparatus, said measuring apparatus, said comparison module, and said classification module are integrated in a semiconductor fabrication line for

providing at least one of an in situ production monitoring and an in-line production monitoring.

Claim 22 (original). The device according to claim 20, wherein:

said measuring apparatus includes an electromagnetic radiation source for providing a coherent electromagnetic radiation, a rotation apparatus for rotating a polarization of the coherent electromagnetic radiation, said rotation apparatus rotating the polarization in one of an infinitely adjustable manner and in small increments, and at least one electromagnetic radiation detector; and

said measuring apparatus is configured such that the coherent electromagnetic radiation hits a structured test specimen surface at a fixed angle of incidence, and such that one of a local distribution and an intensity distribution of a diffraction image generated by reflecting the coherent electromagnetic radiation at the structured test specimen surface is measured as a function of the polarization by using said at least one electromagnetic radiation detector.

Claim 23 (original). The device according to claim 20, wherein said measuring apparatus includes an electromagnetic

radiation source for providing an electromagnetic radiation with a given wavelength, the wavelength is selected such that dimensions of the individual structures of the test specimen surface are of a same order of magnitude as the given wavelength.

Claim 24 (currently amended). The device according to claim 20, wherein:

said ~~measuring apparatus includes an~~ electromagnetic radiation source ~~for providing an~~ provides the electromagnetic radiation with one of a plurality of wavelengths and a plurality of wave length ranges; and

said measuring apparatus carries out a measurement one at a time as a function of the one of the plurality of wavelengths and the plurality of wave length ranges.

Claim 25 (cancelled).

Claim 26 (original). The device according to claim 20, wherein said measuring apparatus includes a spectral lamp for providing coherent light and filters for extracting various wavelength ranges from the coherent light.

Claim 27 (currently amended). The device according to claim 20, wherein:

~~said measuring apparatus includes an electromagnetic radiation source for providing an electromagnetic radiation and a rotation apparatus for rotating a polarization of the electromagnetic radiation;~~

said rotation apparatus rotates the polarization in one of an infinitely adjustable manner and in small increments, and said rotation apparatus is an element selected from the group consisting of a $\lambda/2$ plate, two $\lambda/4$ plates, an electro-optical element, and a mechanical rotating apparatus for mechanically rotating said electromagnetic radiation source.

Claim 28 (original). The device according to claim 20, including a movable mounting table for holding a test specimen when measuring at least one distribution selected from the group consisting of a local distribution and an intensity distribution of diffraction images in various regions of the test specimen.

Claim 29 (original). The device according to claim 20, wherein said measuring apparatus is moved with respect to a test specimen when measuring at least one distribution

selected from the group consisting of a local distribution and an intensity distribution of diffraction images in various regions of the test specimen

Claim 30 (original). The device according to claim 20, wherein said measuring apparatus examines an electromagnetic radiation reflected by the test specimen surface to be monitored.

Claim 31 (original). The device according to claim 20, wherein said classification module includes a diffraction simulator for determining absolute profile parameters from measured signatures.